

REMARKS

This is in response to the Office Action dated January 23, 2006. Claims 29, 32-33 and 38-62 are pending.

Claim 29 stands rejected under 35 U.S.C. Section 103(a) as being allegedly unpatentable over Jiang (US 5,956,364) in view of Tomomura (US 6,358,822; WO 98/44539). This Section 103(a) rejection is respectfully traversed for at least the following reasons.

Jiang discloses a Vertical Cavity Surface Emitting Laser (VCSEL) with an integrated shaped cavity mirror. Moreover, Jiang discloses the use of molecular beam epitaxy (MBE) to form indium gallium arsenide aluminum nitride (InGaAsAlN) (e.g., col. 3, lines 13-26). However, Jiang fails to disclose or suggest simultaneously supplying ammonium (NH₃) and aluminum (Al) to a surface of the crystal using a substrate temperature of from 450-640 degrees C, such that crystallization of the nitrogen from the ammonium is accelerated by the Al, as required by claim 29.

Recognizing this fundamental flaw in Jiang, the Office Action cites to Tomomura. Tomomura discloses forming GaInNAs using a substrate temperature of 580 degrees C (col. 5, lines 53-55; col. 7, lines 30-41). Tomomura allegedly teaches that a temperature of 500-750 degrees C should be used when NH₃ is used as the nitrogen source (col. 7, lines 30-41). Since Tomomura teaches that a temperature of 500-750 degrees C should be used when NH₃ is used as the nitrogen source, the Examiner contends that it would have been obvious to have used NH₃ as a nitrogen source in Jiang and to have used the temperature of 500-750 degrees C as taught by Tomomura. However, this Section 103(a) rejection is incorrect for at least the following reasons.

While Tomomura teaches a substrate temperature of 500-750 degrees C when using NH₃ to form GaInNAs (col. 5, lines 47-57; col. 7, lines 30-41), Tomomura does *not* disclose or

suggest using such temperatures when forming a layer with Al therein via MBE– which is a key point of the invention of claim 29. The instant inventors have surprisingly found that using temperatures from 450-640 degrees C during MBE is surprisingly beneficial when supplying NH₃ and Al at the same time in that crystallization of the nitrogen from the ammonium is accelerated by the Al at this temperature range. The cited art fails to disclose or suggest this unexpected phenomenon.

Tomomura’s discussion at col. 15, lines 25-30, relied on by the Examiner, merely mentions As, P, Sb, Bi, B, Al, Ga and In in a laundry list of materials for a III-V compound. There is no discussion or suggestion by Tomomura in this respect of using temperatures from 450-640 degrees C during MBE when supplying NH₃ and Al at the same time so that crystallization of the nitrogen from the ammonium is accelerated by the Al at this temperature range. This portion of Tomomura does not even say that ammonium is used, and certainly does not state or suggest supplying ammonium and Al at the same time, let alone at the claimed temperature range in a MBE process as called for in claim 29. There is simply no suggestion in the cited art for the invention of claim 29; hindsight is not permitted.

Tomomura has only been found to disclose that “the substrate temperature in a range of 500 to 750 degrees C can be used when NH₃ is used as the nitrogen source” (col. 7, lines 30-41). However, in contrast, claim 29 specification requires that “wherein the substrate is at a temperature of 450 degrees C or more and less than 640 degrees C *when the aluminum and ammonium are applied* in growing the III-IV compound semiconductor . . .” Accordingly, Tomomura fails to disclose, teach or suggest setting a substrate temperature in a range of 450-640 degrees C “when the aluminum and ammonium are supplied” in growing the III-IV compound semiconductor as called for in claim 29.

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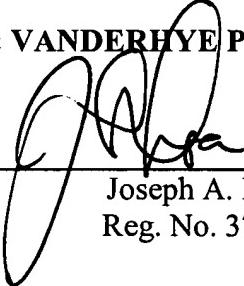
The Office Action contends that Tomomura suggests supplying aluminum and nitrogen simultaneously, citing col. 15, lines 25-31 (see pg. 7 of the Office Action). However, although Tomomura may have included Al in a laundry list of Group III elements, this does not mean that Al and ammonium are supplied simultaneously as required by claim 29. In this regard, the Office Action relies on impermissible hindsight.

In view of the above, it is respectfully submitted that the cited art fails to disclose or suggest the invention of claim 29. Thus, the Section 103(a) rejection should be withdrawn. All claims are in condition for allowance. If any minor matter remains to be resolved, the Examiner is invited to telephone the undersigned with regard to the same.

Respectfully submitted,

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